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ABSTRACT

The interactive effects of a student's conceptual level and the structure of the teaching environment are examined. Concept level for the purposes of this study is identified as maturity in information processing and in interpersonal competence. Thirty-three preservice teachers were classified as being at a high, middle, or low conceptual level. Instruction techniques for these students were considered as "high structure" (criteria highly controlled by the instructor) and "low structure" (criteria minimally controlled by the instructor). Results indicate that low-concept-level learners benefit more from high-structure instructional environments than from low-structure environments, and, conversely, high-concept-level students profit most from low-structure environments and are less affected by the variation in structure. (JD)

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A STUDY OF THE EFFECTS OF ENVIRONMENTAL STRUCTURE ON STUDENTS OF DIFFERING CONCEPTUAL LEVELS

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Before we can help teachers grow professionally and personally, we must consider how they relate to the world, the structural complexity of their thinking, and how they respond to different environments. This will enable us to select appropriate strategies and design educational environments that will most productively impact their learning.

The intent of this paper is to report a study designed to investigate the interactive effects of the personological trait of conceptual development and the differentiated structure of teacher training environments. The theoretical rationale for this study is grounded in the basic foundations of field theory: a) behavior has to be derived from a totality of coexisting facts, and b) these coexisting facts have interdependent characteristics such that the state of any part of this field depends on every other part of the field. From the preceding statement Kurt Lewin (1935) established his well-known postulate that behavior (B) is a function of the person (P) and the environment (E). Lewin's formula B = f(PE) is translated as an educational person-environment interaction paradigm. In the educational context, the B-P-E paradigm states that learning outcomes (B) are a result of interactive effects of different kinds of students (P) and different kinds of teaching approaches (E). B-P-E in its true paradigmatic sense is a way of thinking about teaching and learning which can determine what questions need to be asked, what observations made, and what information might be presented and in what form.

Harvey, Hunt, and Schroder (1961) developed a conceptual systems theory which describes persons on a developmental hierarchy of increasing complexity of information processing and interpersonal maturity. Hunt (1971) subsequently revised the model to differentiate more clearly how persons vary on the

conceptual level dimension from low (immature, unsocialized) to high (inter-dependent, self-reliant). In addition, students and environments have been matched (Hunt, 1971) according to CL (conceptual level) and corresponding degree of structure or organization provided by the environment. This basic matching principle is summarized as "low CL learners profit more from high structure and high CL learners profit more from low structure, or in some cases, being less affected by the variation in structure" (Hunt 1971, p. 44).

Recent matching studies, however, have raised questions regarding the definition of "structure". The questions below raised by prior researchers in this line of inquiry illustrate this. "Does structure refer to the degree of teacher-directedness, or to the models insusceptibility to student pull (i.e. how students influence teachers). Or does structure refer to the skill demands required of students in different phases of the model so that a highly structured model would demand less complex skills?" (Hunt, Joyce et al. 1974, pp. 25-26). "Is an environment which allows students to choose from a given set of learning activities, sequence these activities and pace their own work, really a "low" structure environment?" (McNergney, 1974, p. 77).

This study, then, builds upon prior work to more fully explicate (E) variation in the learning environment, (P) how students perceive and define these differences, and (B) how these perceptions influence the process and completion of the task.

Methodology

Investigations of the complex phenomena of human interaction have repeatedly demonstrated that a single research methodology is inadequate. The literature is replete with discussions regarding the relative merits of both the positivist and the phenomenological perspectives. There is an increasing acceptance of

differential effects approaches for distinct areas of study attempting to explain more fully complex human interaction such as the B-P-E paradigm, e.g. social psychology (McGuire, 1973), evaluation (Carini, 1975), personality (Sarason and Smith, 1971), educational psychology (McKeachie, 1974, and Cronbach and Snow, 1977), behavioral genetics (Vale and Vale, 1969), and social science (Mehan and Wood, 1975).

Each of these perspectives (positivist and phenomenological) provides support and substantiation to this study of a multi-dimensional, complex phenomenon. The positivist paradigm yields quantifiable information regarding the subjects' achievement and attitudes toward the different training interventions. This information can lead to generalizable statements concerning the use of conceptual systems theory in teacher training. The phenomenological paradigm describes and defines the subjects' perceptions of the training interventions. This information can be used to explicate better the dimensions of environmental structure. The combined information should also provide a better understanding of conceptual systems theory in terms of whether or not the interventions employed in this study stimulated learning or elicited positive attitudes. Therefore, dual research methodologies were used in this study. Aspects of performance and affect were examined utilizing a positivist, experimental post test only factorial design (Campbell and Stanley, 1963). The phenomenological methodologies of participant observation and open-ended interviews(Bogdan and Taylor, 1975) were used to analyze the subjects' perceptions of structure.

With respect to the experimental nature of the study, two (2) sections each having (33) preservice teachers were classified as being high, middle or low CL as measured by the Paragraph Completion Test (Hunt, Butler,

Noy and Rosser, 1977). After determining the CL scores, the subjects were rank-ordered and divided into thirds. There was a statistically significant difference ($p < .001$) among the groups by CL. By using matched pairs (conceptual level and grade point average) two matched sections were formed.

The treatments (instructional interventions) were the Jurisprudential Model of Teaching which characterized high structure and the Group Investigation Model of Teaching which characterized low structure, as designed by Joyce and Weil (1972) and Bents (1978). Each section (Section A and Section B) of preservice teachers received five forty-five minute treatment sessions for each model of teaching. These sessions also included the post-test and unstructured interviews. During the training sessions trained participant observers focused on how the subjects reacted to, and defined structure in the different treatments. Video tapes of the sessions were also used to assist in the observation and analysis.

Six criteria for structuring a lesson were used in the design of a high structure instructional model: the Jurisprudential Model of Teaching (Oliver & Shaver, 1966) and a low structure model: Group Investigation Model of Teaching (Thelen, 1960). The following chart lists the criteria as they were applied in the treatments.

High Structure	Low Structure
Jurisprudential Model Criteria were highly controlled by the teacher	Group Investigation Model Criteria were minimally controlled by the teacher
1. No options offered in terms of materials, sequencing of same, and rate of learning.	1. Choice available among options choice existed in materials, classroom or group responsibility and rate of learning.

2. Little, if any teacher susceptibility to student influence did not respond to student attempts or wishes to alter structure.	2. Teacher susceptible to student influence and responded to accommodate needs and wishes of the student.
3. Cognitive skill demands and questions were convergent.	3. Cognitive skill demands and questions were divergent.
4. Reinforcement of any stimulus or response that indicated movement toward desired outcome.	4. Non-reinforcement in any direction, would respond with "What do you think?", "It's up to you." etc.
5. Time was set for all activities, completion times set.	5. Time was relatively flexible or open-ended, no completion of task designated.
6. Rules given first followed by examples.	6. Examples given and rules generated from the examples.

Therefore; 1) choosing among options, 2) the degree to which students influence the teacher in other dimensions of the environment, 3) cognitive skill demands in terms of convergent and divergent thinking, 4) reinforcement, 5) time, and rule-example/example-rule sequencing were manipulated to determine the degree of structure of the educational environment.

Experimental (Quantitative) Results

The central experimental hypothesis put forth in this study to test the matching model was as follows: (H_1) there will be no difference in achievement outcomes among the high CL, middle CL, and low CL groups as a result of the two differentiated treatments. In the analysis of H_1 a three-way analysis of variance (Anderson & Frisch, 1971) was conducted. A statistically significant difference ($p < .01$) was found between the high structure treatment (Jurisprudential Model) and the low structure treatment (Group Investigation Model). There was also a statistically significant difference ($p < .01$) among the high, middle and low CL groups. In addition,

there was a statistically significant difference ($p < .05$) between Section A and Section B. The mean scores and summary statistics are shown on Table 1 and Table 2.

TABLE 1

Achievement Mean scores of Three-way Analysis of Variance for H_1

		Section A	Section B	
High Conceptual Level	Jurisprudential	21.29	22.14	
	Group Investigation	21.43	20.86	
				21.44
Middle Conceptual Level	Jurisprudential	22.57	22.29	
	Group Investigation	16.57	20.29	
				20.43
Low Conceptual Level	Jurisprudential	22.43	20.14	
	Group Investigation	14.43	18.29	
				18.83

Jurisprudential	- 19.79
Group Investigation	- 20.67
Section A	- 21.81
Section B	- 18.64

TABLE 2

Summary Statistics of Three-way Analysis of Variance on Achievement Test Scores for H_1

sv	df	ss	ms	F
Between pairs	20			
Conceptual level	2	96.88	48.44	3.06
Error CL	18	285.12	15.84	
Within pairs	63			
Section	1	16.29	16.29	1.53
CL x Section	2	8.72	4.36	.41
Error Section	18	192.06	10.67	
Treatment	1	210.58	210.58	34.81**
CL x Treatment	2	73.72	36.86	6.11**
Error Treatment	18	108.90	6.05	
Section x Treatment	1	44.29	44.29	5.84*
CL x Section x Treatment	2	53.30	26.65	3.51
Error Treatment x Section	18	136.62	7.59	

*$p < .05$

**$p < .01$

(The analysis utilized 42 subjects. This was done because of some missing data and the maintaining of matched pairs and equalizing the number of subjects in each cell.)

In addition, the examination of the Hypothesis 1 analyzed four specific aspects. First, the difference in achievement outcomes among the high, middle, and low CL groups as a result of the high structure treatment (Jurisprudential Model) was subjected to an analysis of variance (Hohlen, 1975). This resulted in no significant differences. This supports the contention that high CL learners do as well as low CL learners in a high structure environment. These results are expected since in a developmental pattern the learners at higher levels of cognitive complexity are able to function at lower levels as well.

Second, the difference in achievement outcomes among the high, middle, and low CL groups as a result of the low structure treatment (Group Investigation Model) was subjected to analysis of variance. This resulted in a statistically significant difference ($F_{(2,41)} = 6.94$, $p < .05$). This supports the contention that high CL learners do better than low CL learners in low structure environments.

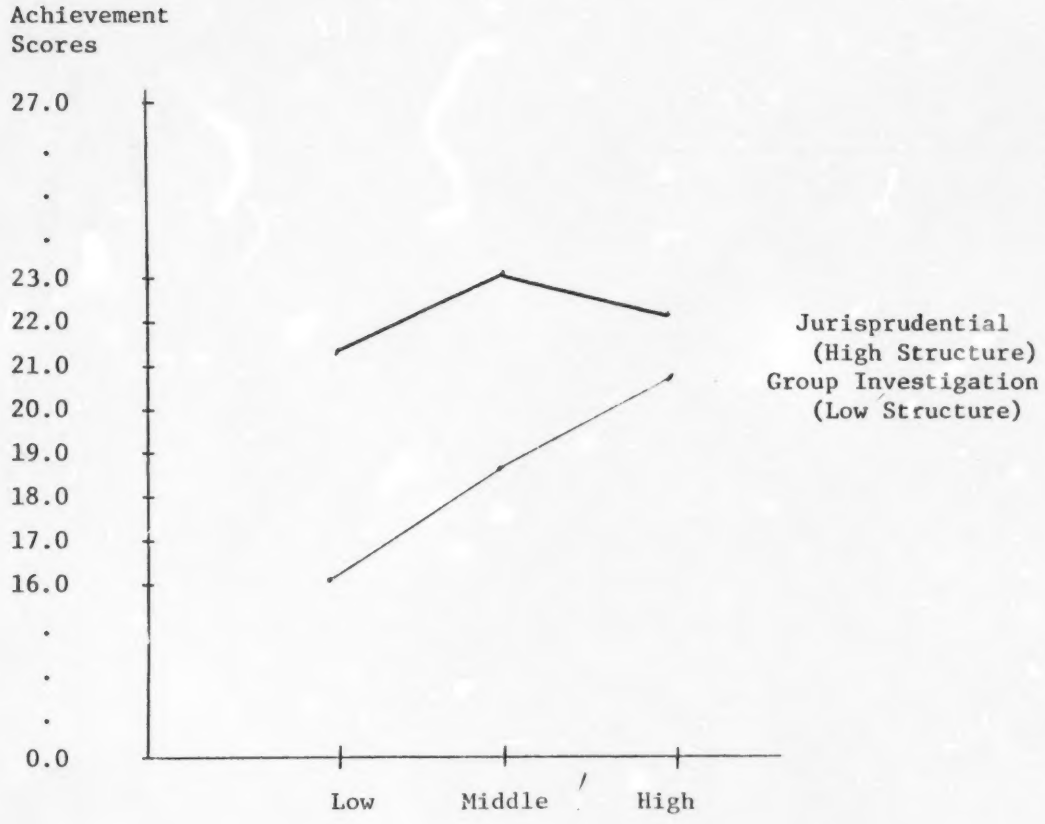
Third, using repeated measures analysis of variance (Veldman, 1967), the difference in achievement outcomes between the high structure (Jurisprudential) and low structure (Group Investigation) treatments from the low CL group resulted in a statistically significant difference ($F_{(1,39)} = 23.93$, $p < .05$).

Fourth, the difference in achievement outcomes between the high structure (Jurisprudential) and the low structure (Group Investigation) treatments for the high CL group did not reach a statistically significant level.

The achievement scores support the contemporaneous matching model and reject the hypothesis at a significant level ($p < .05$). Figure 1 graphically summarizes the results.

FIGURE 1

Achievement mean scores by Conceptual Level



All of these results are consistent with the contemporaneous matching model.

Order Effect

Although the differences in mean scores support the contemporaneous matching model, further analysis presents some confounding factors. Analysis of variance for example, indicated that there were no significant main effects for CL when examing Jurisprudential (high structure) achievement mean scores. In other words, CL did not make a difference in these scores. Neither was there any significant main effect for sections, indicating that the order of treatments, i.e., low structure then followed by high structure as opposed

to high structure then followed by low structure, probably had no effect. There was, however, a significant interaction ($p < .05$) between section and treatment indicating some discrepancy among the cell scores. This is shown in Table 4.

TABLE 4

Achievement Mean Scores, Sectior by Treatment

	Jurisprudential	Group Investigation	
Section A	22.10	17.48	19.79
Section B	21.52	19.81	20.67
	21.81	18.65	

The difference between the treatment scores can be attributed to the scores of the lower CL subjects. The scores of Section A and Section B are graphically shown on Figure 2.

FIGURE 2

Achievement Mean Scores for

Section A and Section B

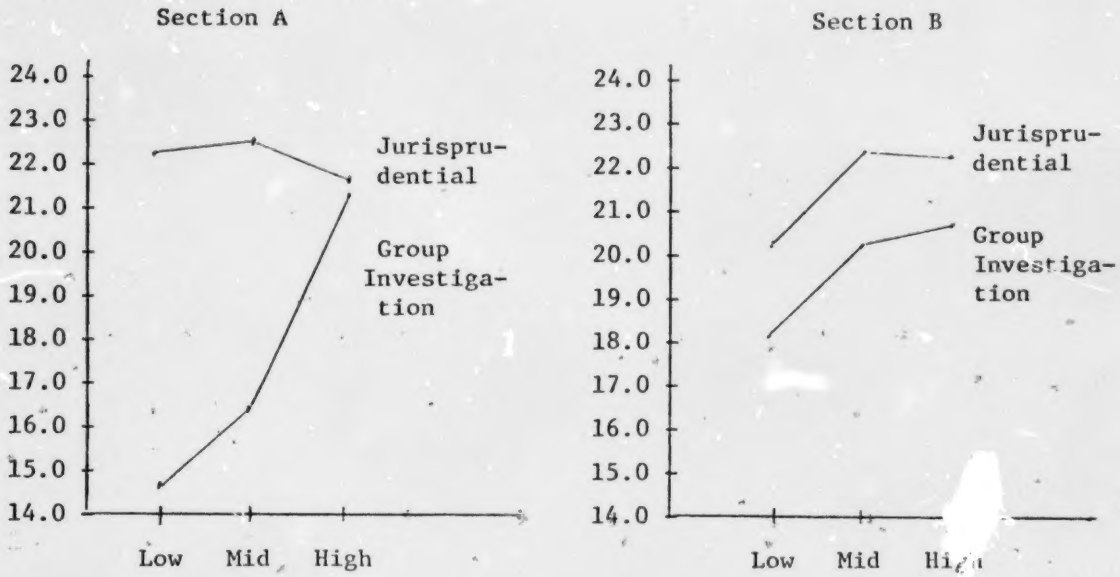


Figure 2 illustrates that there may be an order effect for the low CL subjects. It would appear in this study that the low CL subjects are less able to adjust to a changing situation. Section B received the low structure treatment (Group Investigation) first then the high structure (Jurisprudential) treatment. One explanation is that the influence of the low structure treatment was still prevalent for the low CL subjects during the high structure treatment. The low CL subjects being unable to adjust in a short period of time to changing environments scored poorly on the high structure achievement test.

Section A received the high structure treatment (Jurisprudential) first and then the low structure treatment (Group Investigation). This produced no antithetical dissimilarity among the achievement scores of the high, middle, or low CL groups. However, once again, the low CL subjects in Section A

were unable to adjust to the changing structure of the treatments and scored lower than their counterparts in Section B on the low structure achievement test.

It should also be noted that the Group Investigation mean scores for Section B were significantly higher ($p < .05$) using one-way analysis of variance (Scheffe, 1959) than the Group Investigation mean scores of Section A. Again, this indicates possible order effect. That is, low structure then high structure appears better than high structure then low structure for all classifications of conceptual level. Again, it appears that the low and middle CL groups contribute to produce this differential effect.

Caution must be exercised when interpreting this effect. There was a lack of significant interaction for CL by sections. This does not support the notion that the low and middle CL groups contributed to produce the order effect. It is possible that there were differences in the treatments. When offering the Group Investigation Model (low structure) for the first time with Section B extreme caution could have been exercised to be sure that it was properly carried out. Section A received the Group Investigation model second. It could have been conducted pro forma thereby negating some of the responsiveness to the students that is integral to this model. However, if this did occur the high CL group should have been affected as well. It was not.

On the other hand, this differential effect can be discussed in the context of conceptual systems theory. High CL subjects are more able to productively react to changes in the structure of their environment. In support of this contention, the order (high-low structure or low-high structure) did not produce differential achievement scores among the high CL groups.

The range was only from 21.43 to 20.86, or a difference of .57. Whereas the range for the low CL group was from 14.43 to 18.29, or a difference of 3.86. The middle CL group was from 16.57 to 20.29, or a difference of 3.72. It appears that lower CL subjects are less able to adapt to change in the structure of their environment.

In this study the order of the treatments did make a difference among the low and middle CL groups indicating that if two differentially structured environments are to be used the low then high structure order is most productive for lower CL subjects. When a high degree of structure is provided and then removed, it appears more difficult for the low and middle CL subjects to adjust.

In summary, the data support ($p < .05$) the theoretical proposition that low CL learners profit more from high structure environments than from low structure environments. High CL learners appear to function equally well in high and low structure environments. A review of all of the high CL scores from both sections and both models provide a range of only .99. Whereas the range from the low CL scores is 8.00. In addition, the data supports the notion that lower CL learners are less able to adapt to changes in the structure of their environments than high CL learners.

Measure of Attitudes

The experimental hypothesis put forth stated: (H_2) there will be no difference in attitudes toward the high structure and low structure treatment among the high CL, middle CL, or low level CL groups. A three-way analysis of variance was conducted to test H_2. There were no statistically significant differences in attitude among the high, middle, and low CL groups. However, a statistically significant difference ($F_{(1,63)} = 4.77$, $p < .05$) was found

between Section A and Section B. The discrepancy among the mean scores was found in the scores of Section A on the low structure (Group Investigation) treatment.

This discrepancy between Section A and Section B on the Group Investigation (low structure) test score means is difficult to interpret. One could speculate that the order effect of moving from high structure to low structure has little effect on attitude, whereas experiencing a low structure environment first is a more positive experience resulting in less satisfaction with a high structure after low structure. It might also be that the attitudes of the subjects within the two sections were simply divergent. While the groups were controlled for CL and grade point average, the sections were not equated in terms of their attitude toward a specific phenomenon nor their ability or willingness to express that attitude. Furthermore, there was no interaction among the mean scores on the Jurisprudential (high structure) test, and the CL subgroups' scores were extremely similar.

Descriptive (Qualitative) Results

Do students at different conceptual levels perceive "structure" differently and does the perception of "structure" influence the process and completion of the task? These perceptions are of central importance in the B-P-E interaction paradigm. Different perceptions by an individual regarding the environment will lead to different interactions with that environment. An educator must be aware of the possible differing perceptions. Berliner (1976) states: "If one chooses to work with the concept of 'withitness' or 'warmth' [or in this case, structure] there is a need to measure the concept from as many different perspectives as we can" (p. 11). This study investigated the

perceptions of students at different conceptual levels in order to gain insight regarding the concept of "structure" as used to differentiate learning environments.

Three trained participant observers gathered data during the treatment sessions. The observers were not conversant with conceptual systems theory nor did they know how the students were grouped. They were aware of the questions regarding structure and conducted the observations and interviews with that focus in mind.

The reporting of the results from the field notes and video tapes of the sessions juxtaposes the subjects' perceptions of structure and conceptual systems theory. This method of reporting identifies and illustrates the subjects' perceptions and relates them to broad theoretical issues, specifically in this study, the B-P-E paradigm (Bruyn, 1967; Glaser & Strauss, 1967; and Bogdan & Taylor, 1975).

The general tendencies of the high, middle, and low CL subjects are reviewed as they were articulated by both the subjects themselves and the participant observers. Discussion of these tendencies and specific derivations made from them are also discussed. These perceptions are finally analyzed in the context of conceptual systems theory and the B-P-E paradigm.

High Conceptual Level Group

Perceptions of the high CL group commonly can be characterized as one of incompatibility with one another in the group. In the words of one participant observer, "There is a strong tendency [for high CL subjects] to disengage and do their own thing."

The high CL group exhibited the following tendencies:

1) incompatibility as a working unit,

2) difficulty staying on task,

3) a feeling of not doing well in the context of the expectations of others, but not really being concerned,

4) relatively frequent tardiness and absenteeism,

5) completing a group task only when obvious structure is accepted, and

6) aggressiveness or reclusiveness.

The group defined structure as determined by the content of the model, the presentation by the instructor, the tasks assigned by the instructor, and the type of feedback given to a student by the instructor.

Middle Conceptual Level Group

The middle CL group had a greater tendency to submit to an existing structure. The instructor spoke and notes were taken rather dutifully. When small group tasks were assigned, a dominant leader would emerge and be accepted by the group. When the leader was not present the group would flounder until someone initiated a course of action.

The middle CL group exhibited the following tendencies:

1) submission to an existing structure, whether it was the instructor, another student or group of students, or a clearly defined structured task,

2) concern for specific, systematic direction, and

3) two factions with more competitiveness and need for closure in one faction and spontaneity and creativity evidenced in the other.

They defined structure solely in terms of the role of the instructor. Therefore, when the instructor provided specific directions as opposed to general guidelines perception of structure changed.

Low Conceptual Level Group

The low CL group appeared to be the most homogeneous of the three groups when reacting to the models. This tendency, perhaps, can be attributed to the subjects' obvious interest in what they thought the instructor wanted them to know and do.

The low CL group exhibited the following tendencies:

1) a definite interest in what they thought the instructor wanted them to know,
2) a difficulty in viewing alternative perspectives,
3) a need for closure or the answer,
4) a desire to complete all sequential phases of a model,
5) a difficulty in differentiating process from content,
6) an avoidance of issues and values, and
7) a satisfaction with a complete task.

The group defined structure in terms of time, content of the activity, focus or goals, and the instructor or their expectations of what they thought the instructor wanted.

Discussion

The preceding comments were intended to illustrate some generic tendencies of each group. The comments were made by the participant observers and students. None of these individuals had any previous contact with conceptual systems theory. Therefore, the parallels that are drawn have some validity. It should also be noted that the preceding comments are in reference only to the subjects in the study. The results are not to be generalized, but rather to assist in obtaining a better definition of structure and to formulate questions that may be empirically tested.

Conceptual Systems Theory

Just as one would expect, according to the conceptual systems theory, the members of the high CL group were better able to analyze the models, evaluate the components of structure, and diagrammatically express their thoughts. One might have expected that the high CL group would be able to work together to achieve a common goal. Yet this was not the case. The group was generally incompatible and exhibited considerable inability to work well together.

Examining the high structure treatment (Jurisprudential) and the low structure treatment (Group Investigation) independently, there is very little difference in how the high CL group responded. The high structure model (Jurisprudential) was met with ambivalence and subtle opposition to the structure. "I don't like to be told how to reach a decision even though it may be democratic" seemed to characterize the feelings.

The low structure treatment (Group Investigation) was met with the same ambivalence and opposition. When the instructor offered some optional activities, a student responded with, "Who cares, let's just pick one." Opposition was frequently directed at any individual within the group who would dominate at a given time. Many individuals shared this dominant role at different times.

The incompatibility among the high CL subjects predominated regardless of the degree of structure within the model. The participant observer characterized individual actions most commonly as being one of two types: aggressive or reclusive. This is somewhat antithetical to conceptual systems theory as the high CL subject should possess a high degree of inter-personal maturity and be able to function productively as a part of a group.

Nonetheless, this behavior did not negatively affect the individual achievement as the scores indicate.

The members of the low CL group exemplified tendencies that one would also expect. Consistent with conceptual systems theory, they were less able to synthesize the information. When structure was absent they expressed anxiety and they continually searched for closure.

Salyachvin's (1972) research indicates that when two kinds of information are presented to low CL subjects they are most affected by what they experience first. This study tends to support that notion. When the members of the low CL group received the high structure treatment (Jurisprudential) first and then the low structure treatment (Group Investigation) they were unable to adapt to the change and continued in a high structure mode. This allowed them to complete tasks and reach closure on issues. It did not allow them to learn the low structure model (Group Investigation) of teaching. A similar carry-over effect occured when the low structure treatment (Group Invesgiation) was administered first. This time the low structure (Group Investigation) model appeared to impact the high structure (Jurisprudential) model thereby not allowing the subjects to learn or experience the high structure (Jurisprudential) model. This carry-over effect is supported by the achievement scores presented earlier.

The middle CL group, while most homogeneous according to the scores on the CL test, was most definitely divided into two factions. The participant observer(s) had difficulty identifying characteristics of the group as a whole. Interestingly this group worked together productively. Assigned tasks were completed. The middle CL group scored higher than the high or the low CL group on the attitudinal tests on both treatments. The positive attitude was

characterized by laughter and positive comments. In addition, after-class discussions were notable in this group as were their continual requests for clarification.

According to conceptual systems theory the middle CL group would operate under identifiable rules and norms and the literal interpretation of them. In a general sense this was true of the members of this group. They indeed indicated a tendency to submit to the existing structure and they were concerned with specific direction. Yet, why the two distinct factions? Perhaps the faction characterized by creativity and spontaneity were entering a transition to the next level. Therefore, the faction characterized by competitiveness and the need for closure more accurately represented a "middle conceptual level" group.

Another explanation might be that competitiveness, the need for closure, spontaneity, and creativity are not mutually exclusive. All of these characteristics can be subsumed in the middle CL. It was merely the group interaction that dichotimized these two factions.

The characteristics and interactions of the middle CL group are indeed an area in need of further study.

Defining Structure

The definitions of structure was paramount in this study. The investigator defined environmental structure as the pattern of organization exhibited by the totality of influences operating in any designated locality. In this study the dimensions of the educational environment were differentially structured using the following six criteria: 1) choosing among options, 2) teacher susceptibility to student influence, 3) cognitive skill demands, 4) reinforcement, 5) time, and 6) rule-example/example-rule. This perception

of structure differed from the subjects' perceptions.

The high CL subjects defined structure as determined by: 1) the content of the model of teaching, 2) the presentation by the instructor, 3) the tasks assigned by the instructor, and 4) the type of feedback given to a student by the instructor.

The middle CL subjects defined structure in terms of the role of the instructor. When the instructor provided specific direction as opposed to general guidelines, the structure of the environment changed.

The low CL group defined structure in terms of 1) time, 2) content, 3) focus or goals, and 4) the instructor or their perceptions of what the instructor wanted.

It is apparent that the perceptions differ. The investigator attempted to explicate clearly environmental structure. It was the investigators perception that the criteria by which structure was differentiated was clearly exhibited in the treatments. Yet the subjects' perceptions were not the same as the investigator's. This lends credence to Richard Snow's (1978) comment, "Some teachers have a tendency to overdifferentiate." Snow was discussing teachers who try to accommodate every idiosyncratic difference among their pupils. He indicated that researchers must search for variables within individual pupils that will prove most productive when manipulated rather than attempting to address the myriad individual differences. The descriptive data gathered as a result of this study support that notion.

It was obvious that the students did not perceive the rule-example/example-rule criterion as a determinant of structure. On the other hand, all three high, middle, and low CL groups mentioned the instructor or the presentation of the instructor as a factor determining structure. It is

possible that all six of the criteria identified by the investigator are subsumed by the students' definition of instructor or presentation of the instructor. This is doubtful, however, because the definitions offered by the students are quite direct and to the point.

It is also possible that the students were unable to articulate their perceptions. This was indeed the case with the low CL group. However, the participant observers were able to (and did) articulate the subjects' perceptions based on actions and reactions during the treatment sessions. This ethnographic analysis did not identify the same criteria cited by the investigator.

The fact that the different CL groups perceived structure differently is perhaps even more important. The concrete aspects of time, content, goals, and instructor identified by the low CL group suggest a much different environment than the content, presentation by the instructor, tasks, and feedback to the students which were identified by the high CL group.

It is interesting to note that both the high and low CL subjects identified content in their definition of structure. Whereas in this study the investigator listed content as a dimension of the educational environment to be manipulated when varying degrees of structure, the high CL group indicated that the content was "filtered" through the instructor. This could be viewed as similar to the investigator's notion of content as a dimension of the enviornment.

Differences by Conceptual Level

This study identified many differences according to CL. Differences in perceptions regarding structure were reviewed in the preceding paragraphs. The study indicated that achievement scores of high CL subjects profit equally

from high or low structure, whereas the low CL subjects profit more from a high structure environment.

The order of treatments (high then low structure, or low then high structure) did not affect the achievement scores of the high CL subjects. The low CL subjects were affected by the order of treatments. They have a tendency to be most affected by the treatment received first. When they are subjected to treatments of differing structure the low to high structure produced the highest achievement score.

The members of the CL groups differ according to how they perform in a group. The high CL group exhibited great difficulty in working as a single unit. Whereas the middle, and low CL groups worked cooperatively toward the completion of a task.

The high CL group scored consistently (but not statistically significantly) lower on the attitudinal test than the middle and low CL groups. There are indeed many differences among the high, middle and low CL groups.

A multiple classification analysis (Andrews, Morgan, Sonquist & Kelm, 1973) attributed 24% of the difference in achievement scores on the Group Investigation Model to CL. How much of the difference is attributable to CL in the descriptive data is open to question. There are obvious differences among the groups. CL and grade point averages were the only relevant variables that were controlled. Motivation, age, moral and ego development along with other personological traits were not controlled. The interaction of these variables could be major contributing factors to the differences among the groups.

The experimental study identified some differences that could be generalizable. The descriptive study identified some differences among

three groups of preservice teachers differentiated by CL. It is imperative that the descriptive differences not be interpreted as generalizable but rather as a basis for further questioning.

Implications and Suggestions for Further Research

The results of the study support Hunt's contemporaneous matching principle which indicates that low CL learners benefit more from high structure instructional environments than from low structure environments and that high CL learners profit most from low structure environments and are less affected by the variation in structure. Perceptual differences of structure were also discerned. The high CL subjects perceived structure to be determined by the content of the model, the presentation by the teacher, the tasks, and the feedback given to the students. The middle CL group defined structure solely in terms of the role of the instructor. The low CL subjects defined structure in terms of time, content, goals, and the instructor of their perceptions of what the instructor wanted.

Potential implications of these findings for designing teacher education interventions are as follows:

- This study supported the contention that differing degrees of structure can be matched to different conceptual levels to be most effective in meeting contemporaneous learning objectives. In addition, it would be beneficial to study other characteristics of individuals (such as group processing skills, need for affiliation, ego development, motivation, and sensory orientations) in terms of their match with different environmental dimensions. Studies of this nature would further assist in selecting and designing appropriate instructional environments.

- Further study is needed to obtain more precise measures of attitude towards specific dimensions of structure. Prior research as well as the descriptive portion of this study indicate that preservice teachers do have differing learning preferences. Both quantative and qualitative methodologies should be used to discern better the specific attitudes and preferences of preservice teacher education students.
- Further study is needed to gather more data on how low CL learners attempt to cope with lack of structure and ways in which periodic forms of structure can be provided. In this same context, research is needed on conceptual development so that attempts to assist low CL learners in low structure environments can also enhance developmental growth.
- Further study is needed on how perceptions of structure are related to duration of time engaged in a specific environment. Are some dimensions of structure immediately identifiable whereas other dimensions manifest themselves over longer periods of time?
- Further study is needed on whether the Paragraph Completion Test used to determine CL assesses interpersonal maturity in parity with information processing, especially in short-term instructional environments.
- Further study is needed on many questions regarding sequencing or programming of teacher education activities. This study supported the order/carry-over effect for the low CL learners. The duration of this effect is yet to be determined. The type(s) of sequencing that might negate this effect have yet to be studied. Differing amounts of time

spent in one type of environment opposed to another type have yet to be studied.

- Further study is needed on how the differences in perception of structure between instructor and students may affect achievement. The major implication here is that if structure differentiates achievement of students at various degrees of conceptual development, to what extent is it critical that both instructor and students are aware of their respective perceptions of structure?
- Further study is needed regarding the structure inherent in content or what the students learn as opposed to the activities and processes a student experiences when learning.

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